

Surface current patterns in front of the Venetian Lagoon and their variability at different time scales

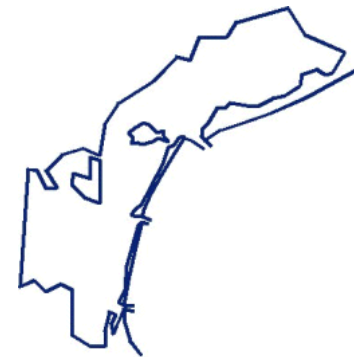
Gačić, M.¹, Kovačević, V.¹, Mancero Mosquera I.¹, Mazzoldi, A.², Cosoli S.², Simionato F.², Paduan J. D.³, Yari, S.^{1,4}

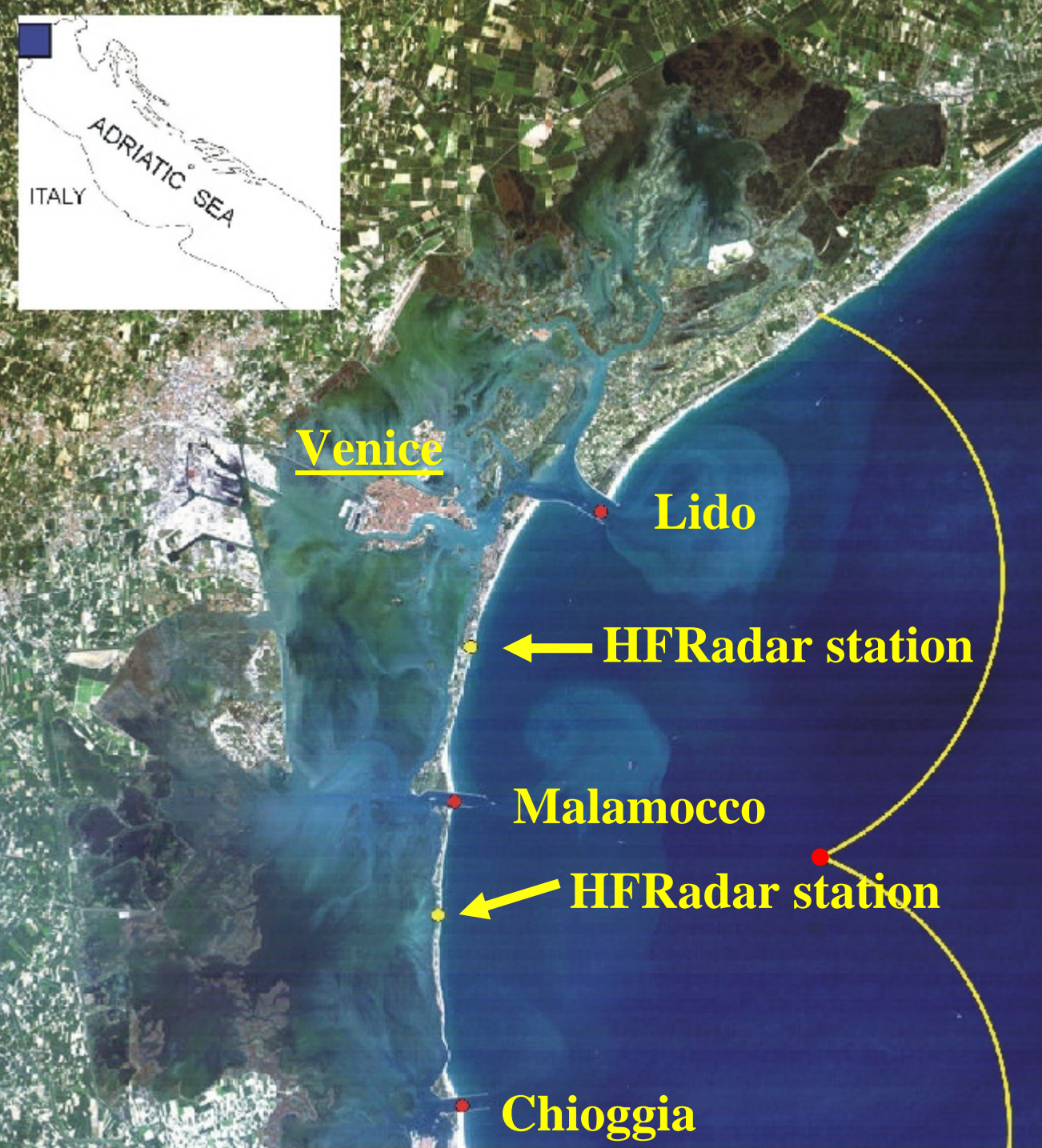
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² Istituto per le Scienze Marine (ISMAR-CNR), Venice, Italy

³ Naval Postgraduate School, Monterey, U.S.A.

⁴ Research Fellow of the “Abdus Salam” International Centre for Theoretical Physics, Trieste, Italy





Hourly record.
Selected period:

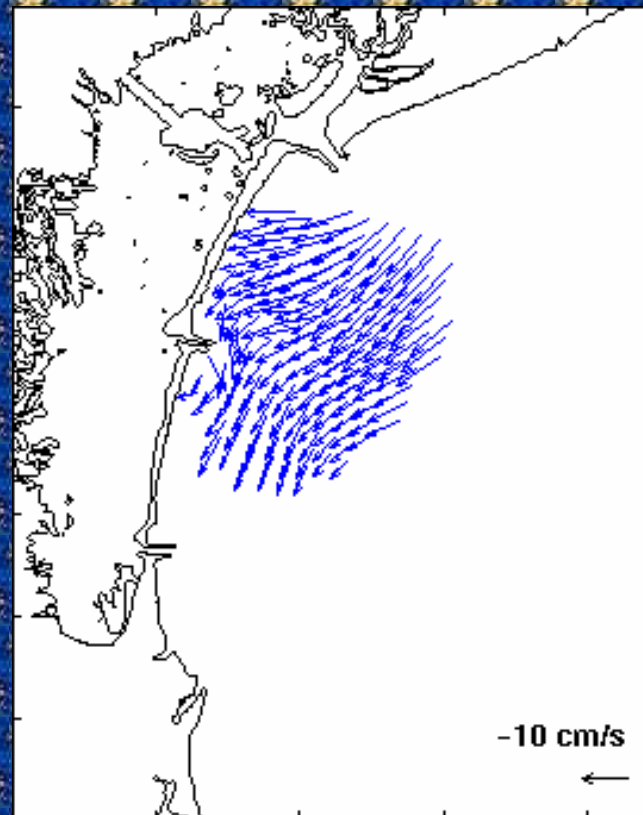
Since: February
2004

Until: November
2005

Type: U and V
current-velocity
components on
sea surface

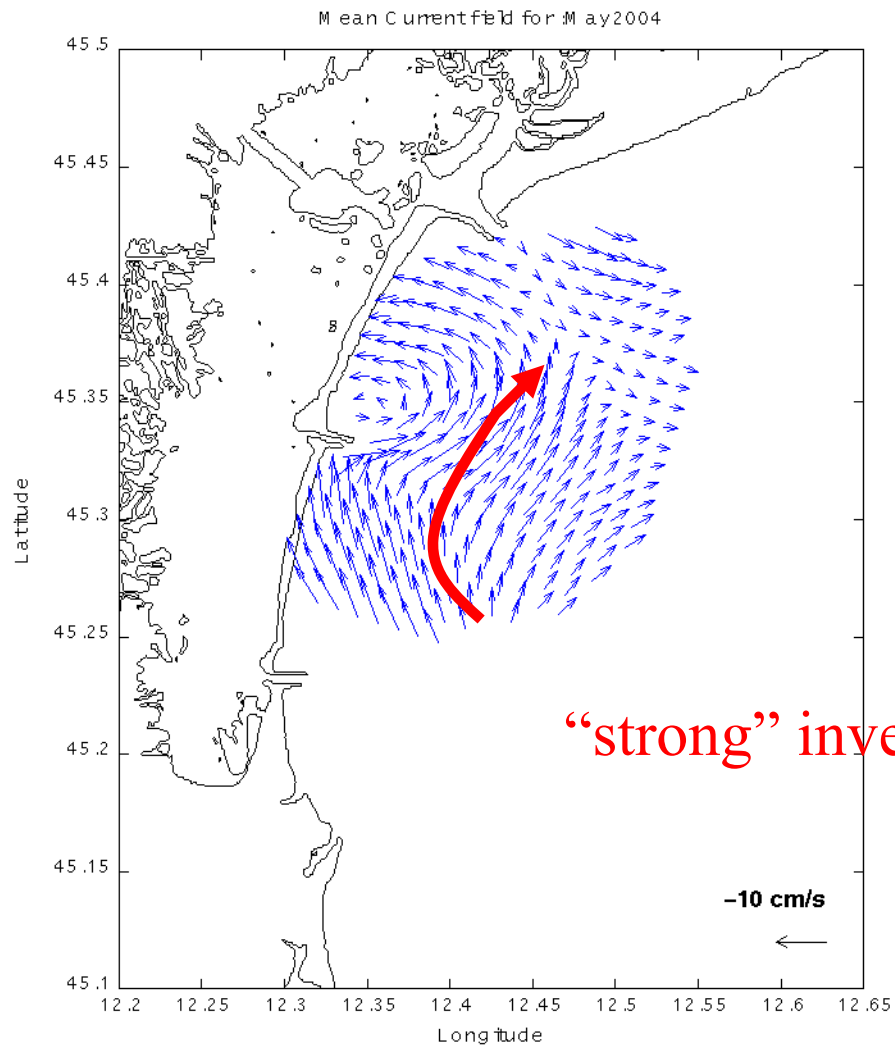
Objective:

Study the surface current field in connection with different wind conditions, also considering the tidal jet in Malamocco channel.

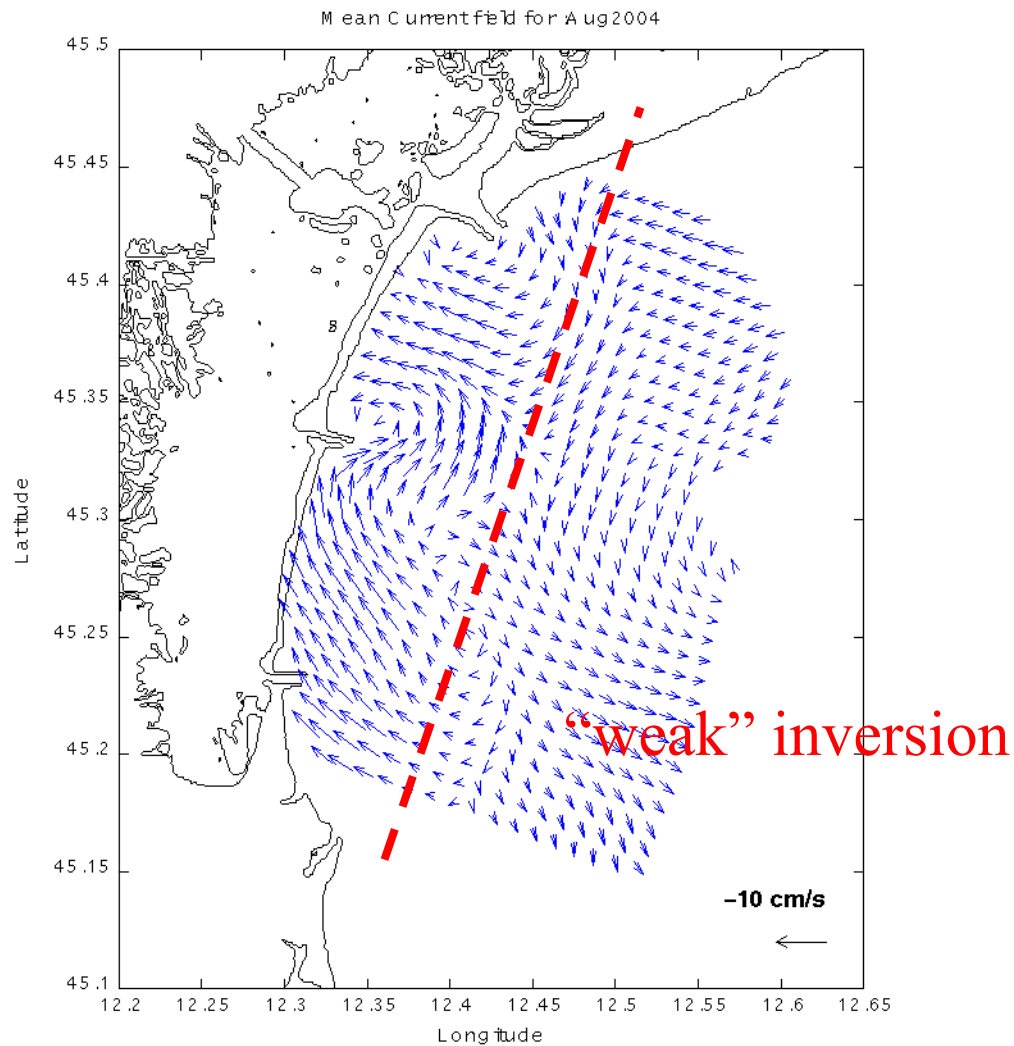


Real data

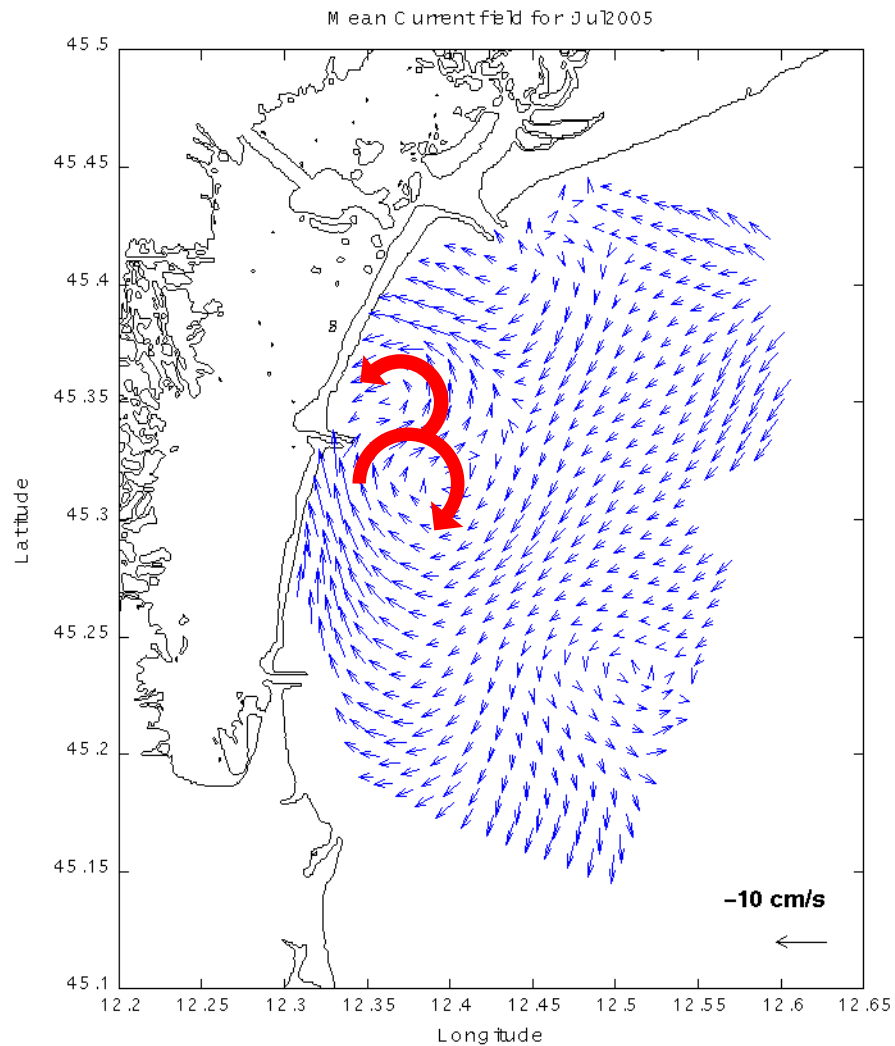
May 2004:



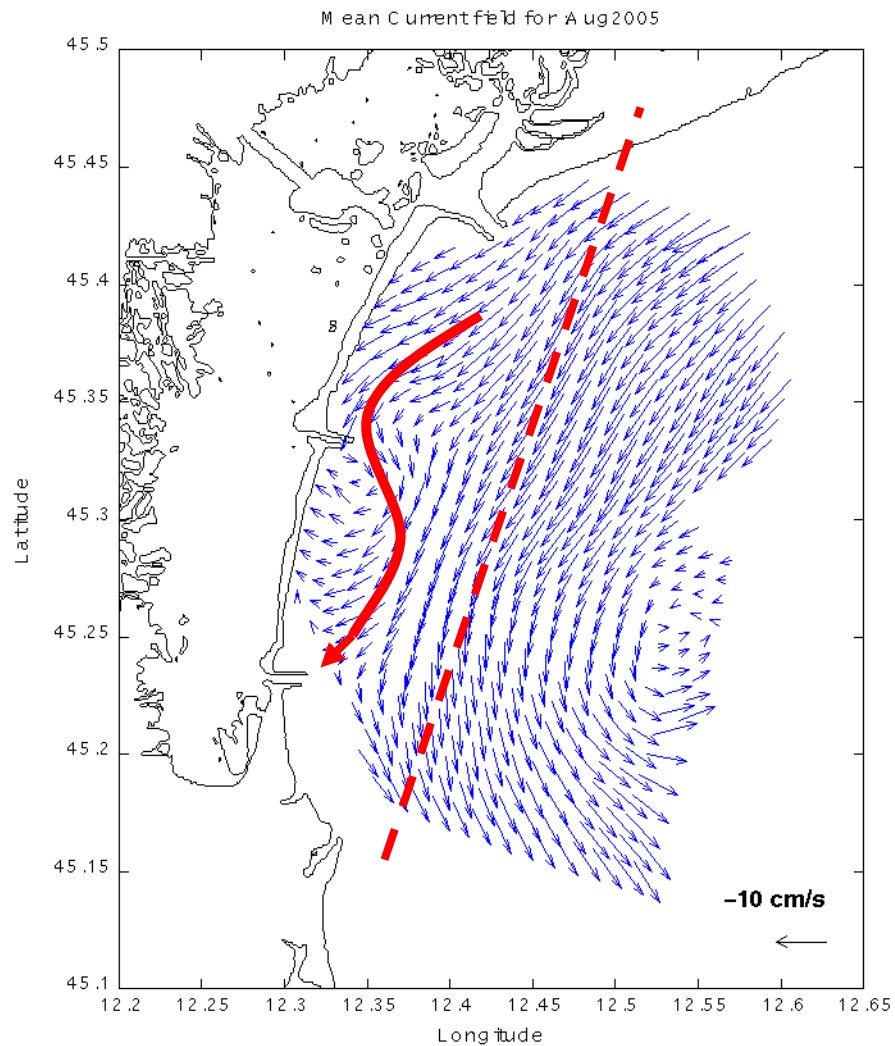
August 2004:



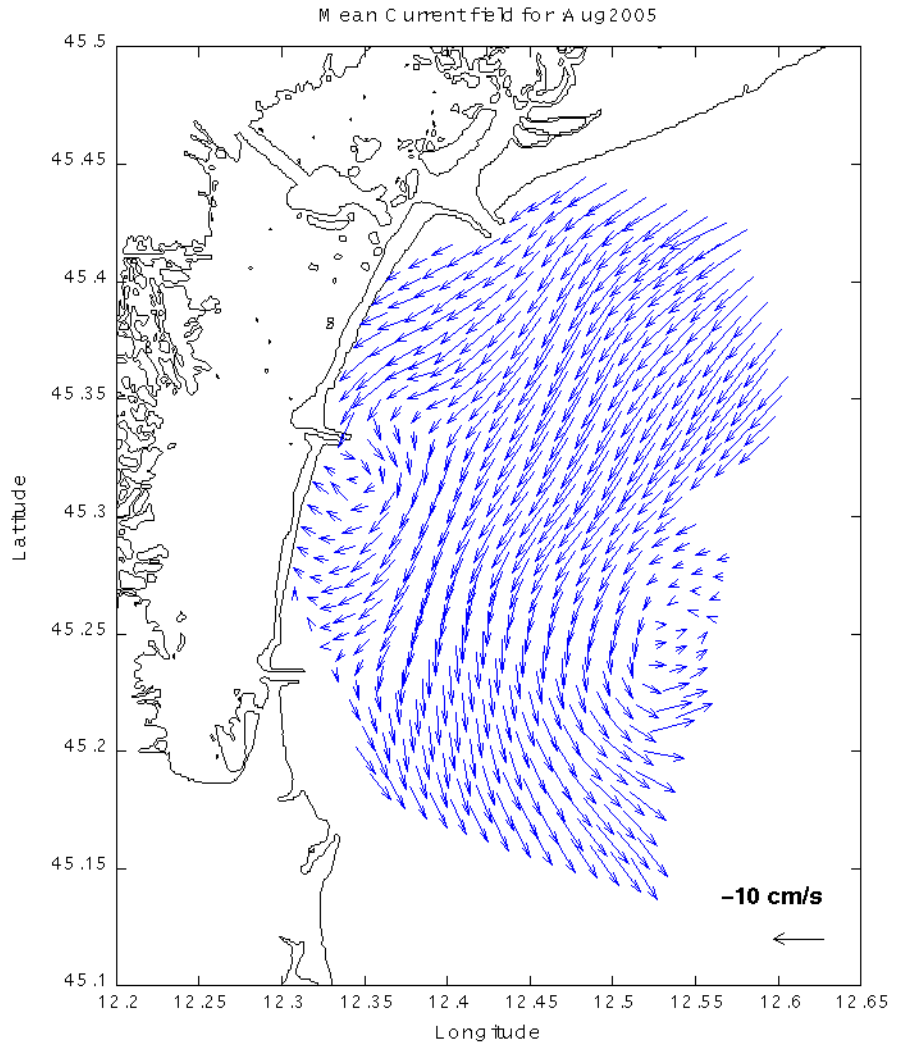
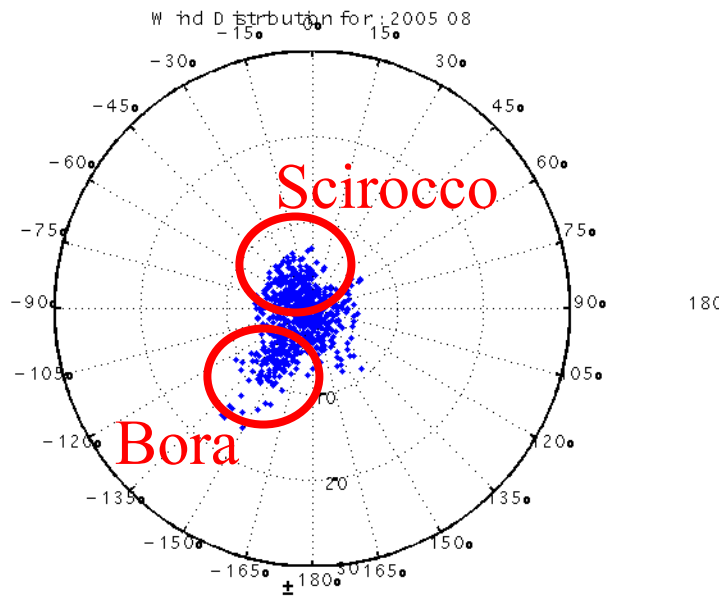
July 2005:



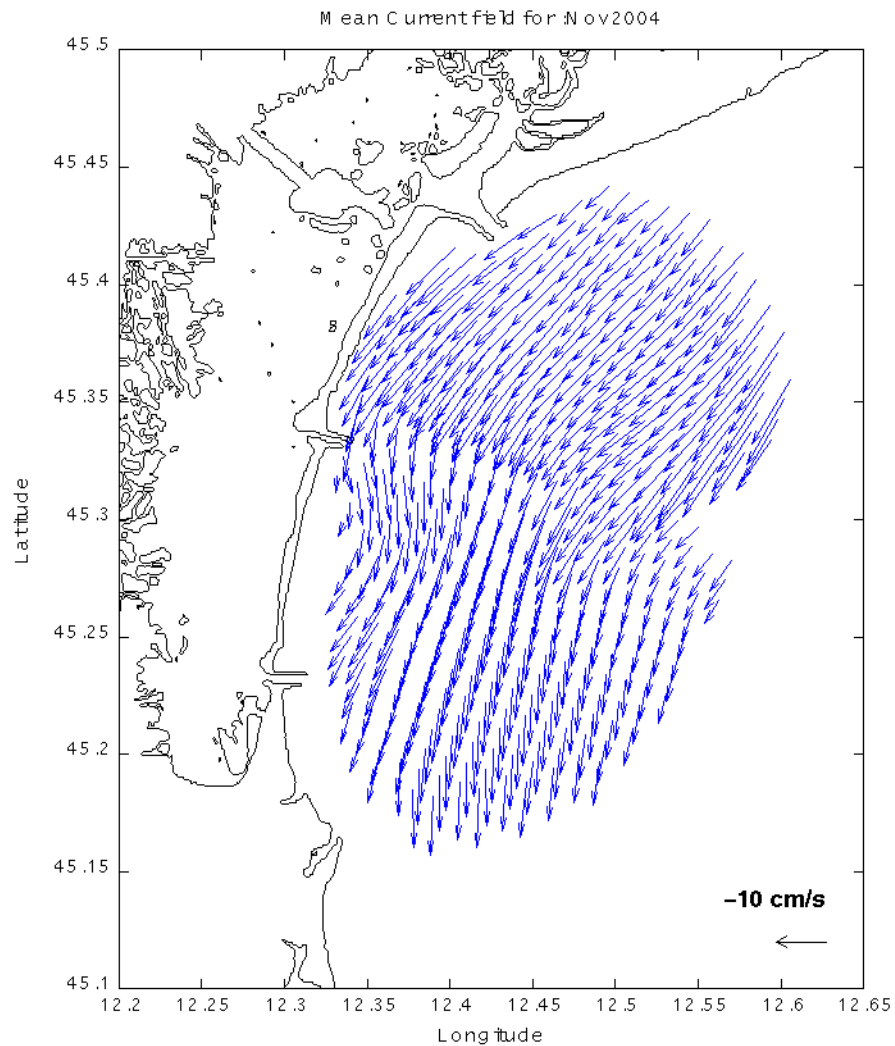
August 2005:



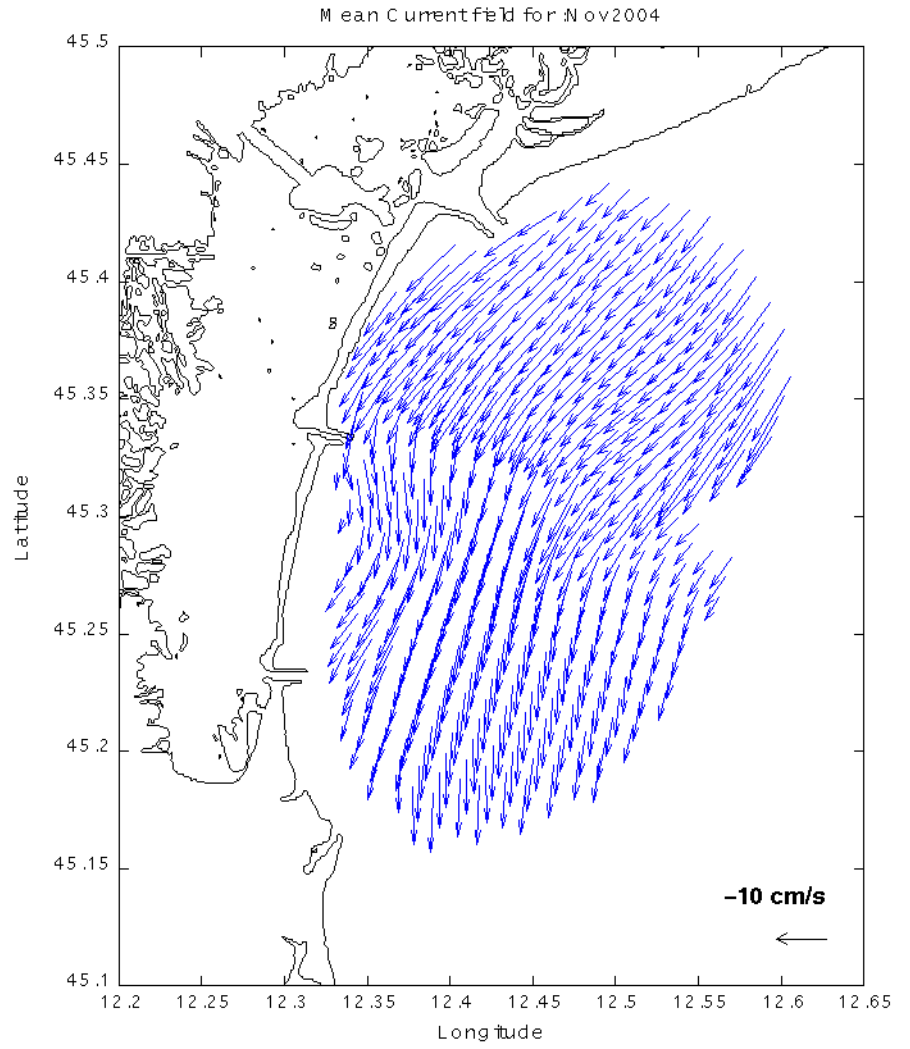
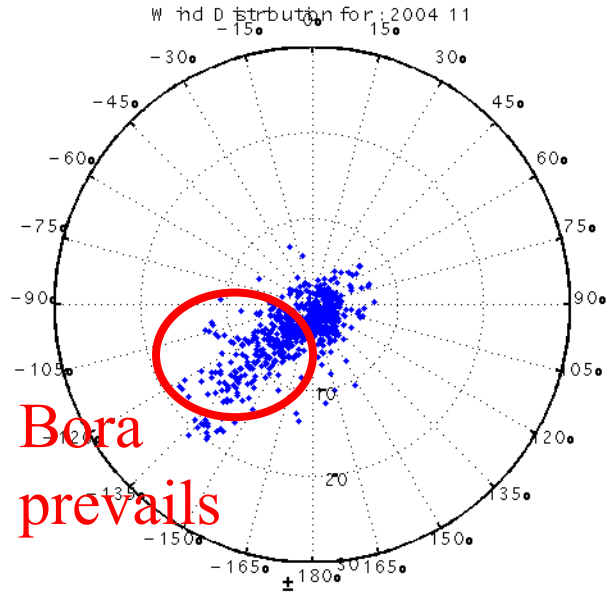
Winds - August 2005:



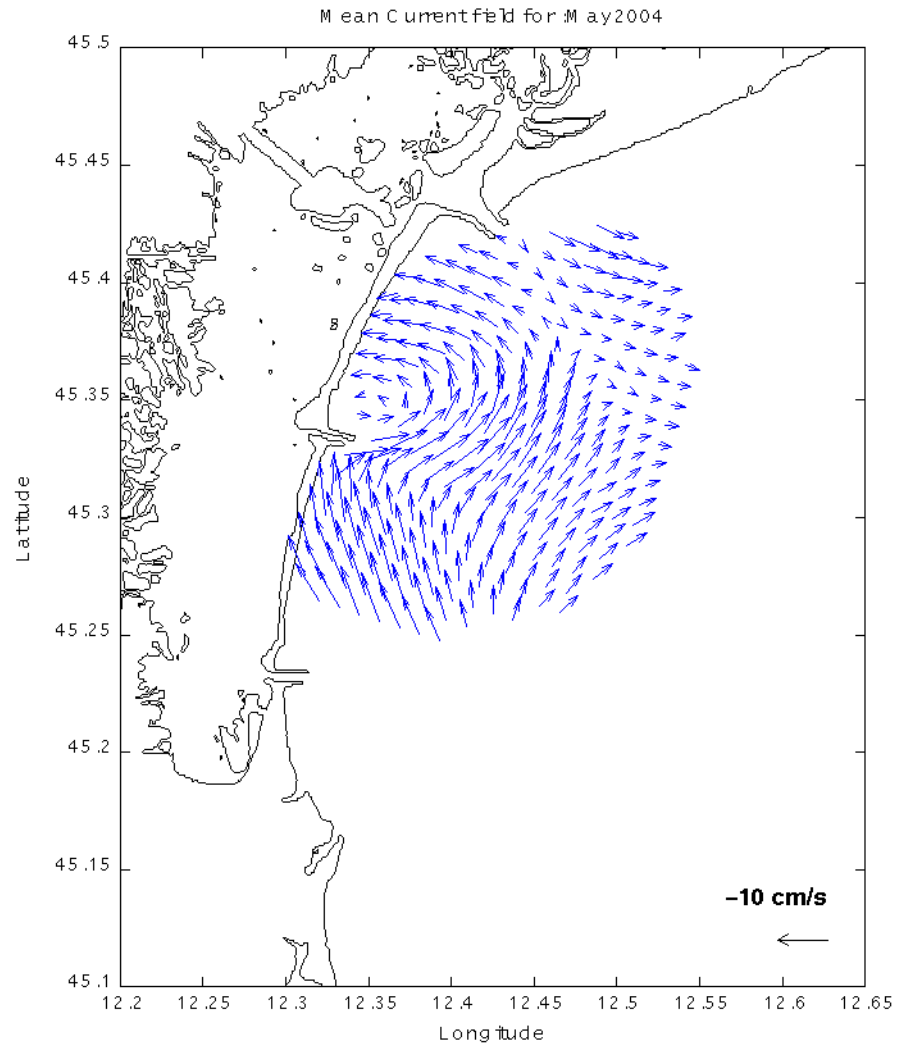
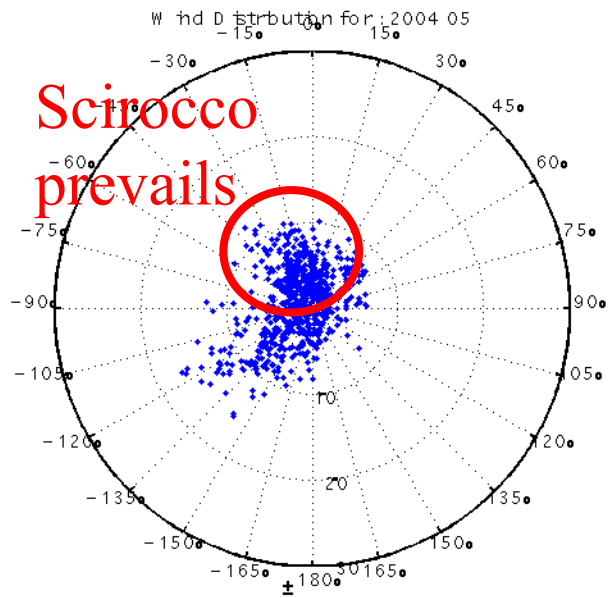
November 2004:



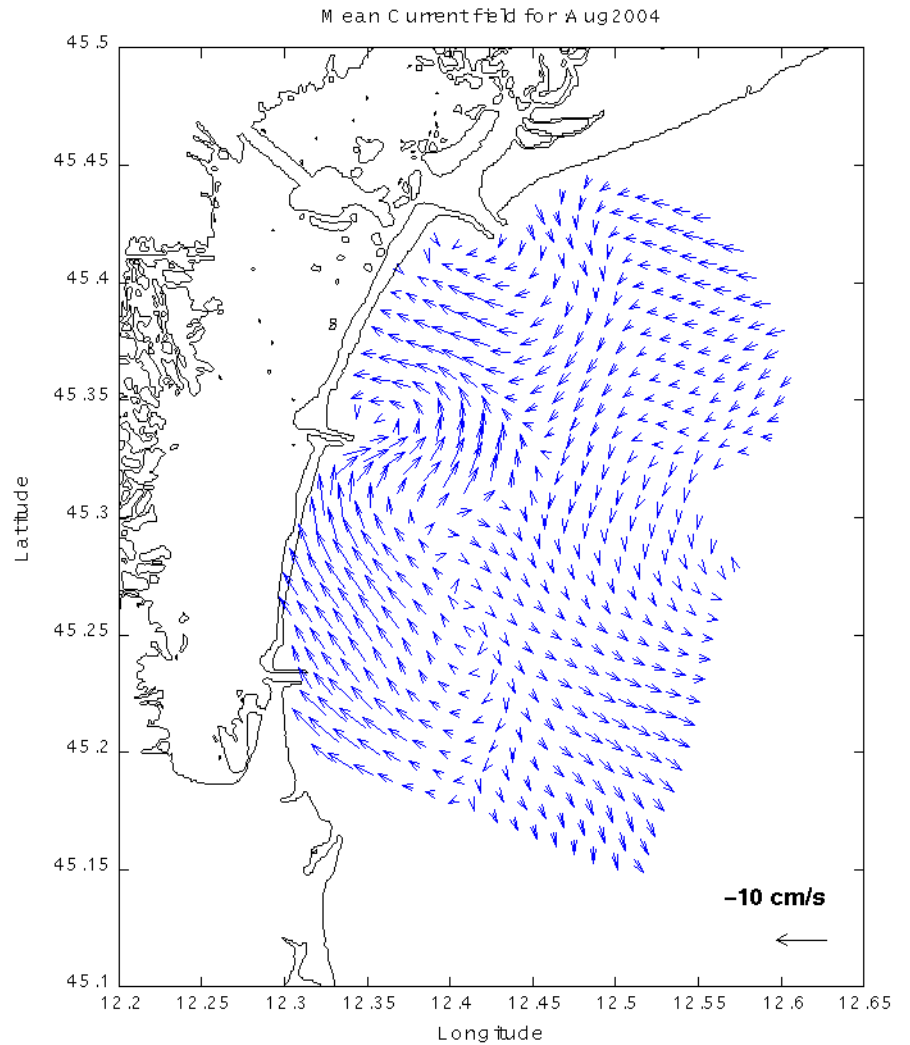
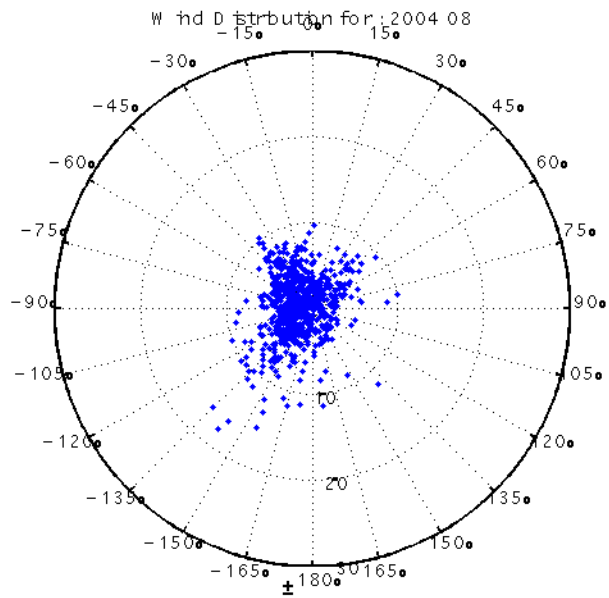
Winds - November 2004:



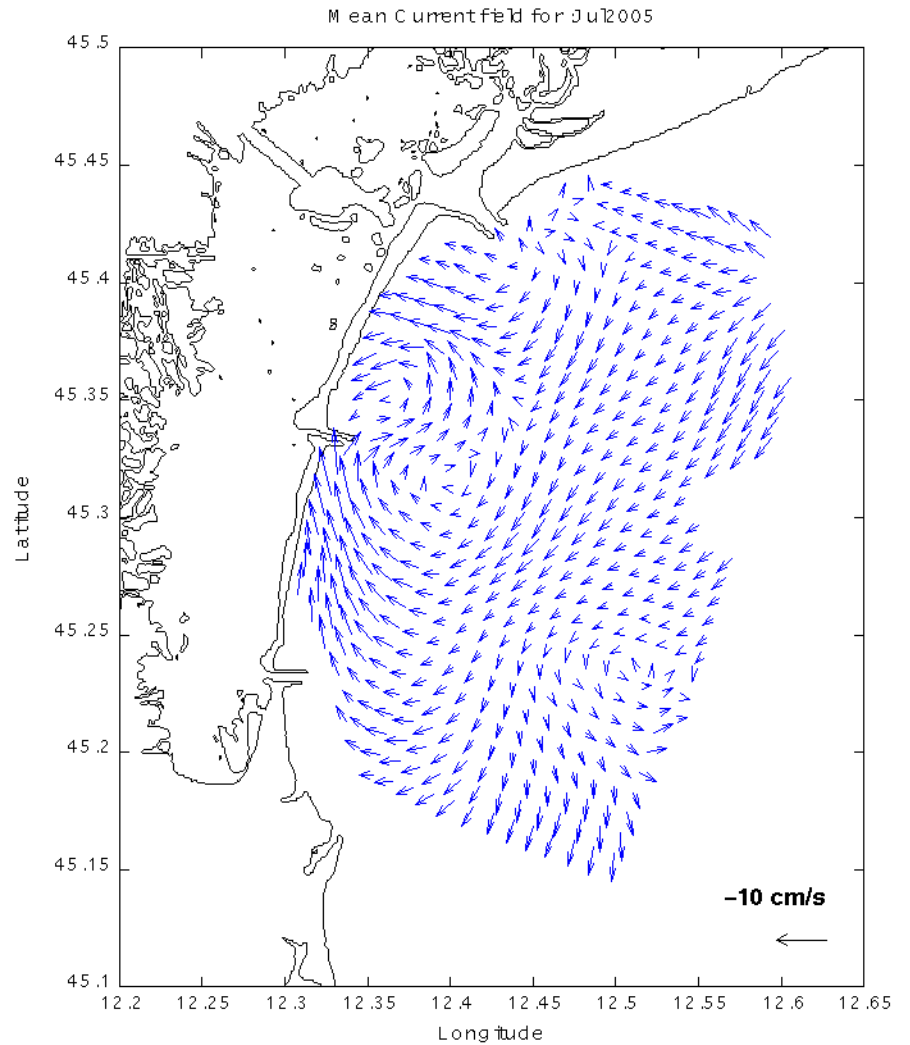
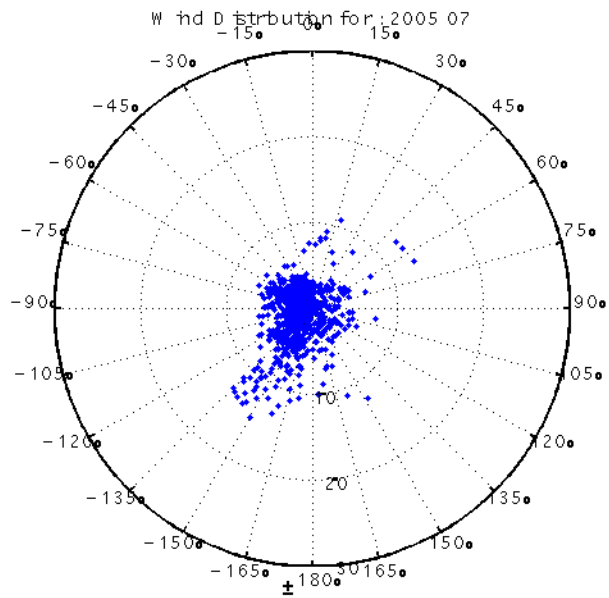
Winds - May 2004:



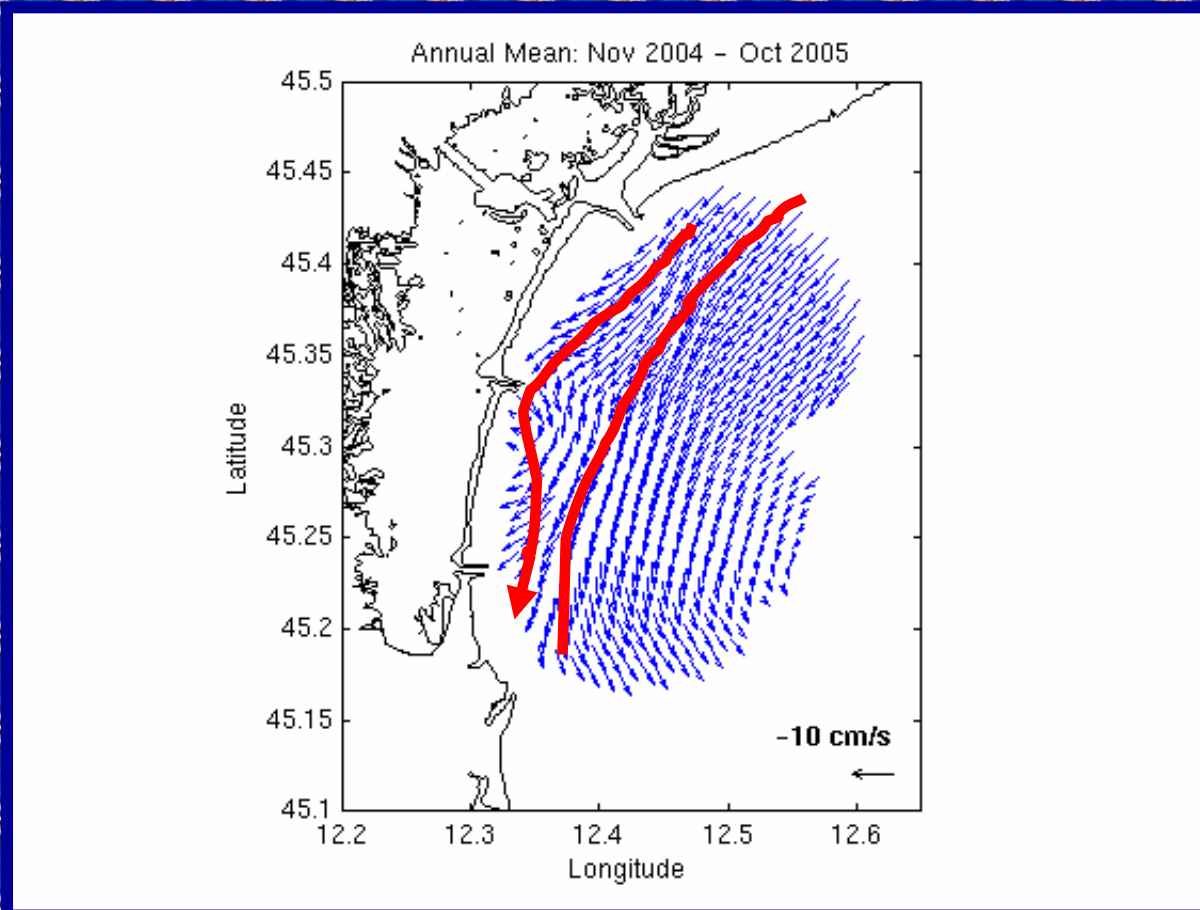
Winds - August 2004:



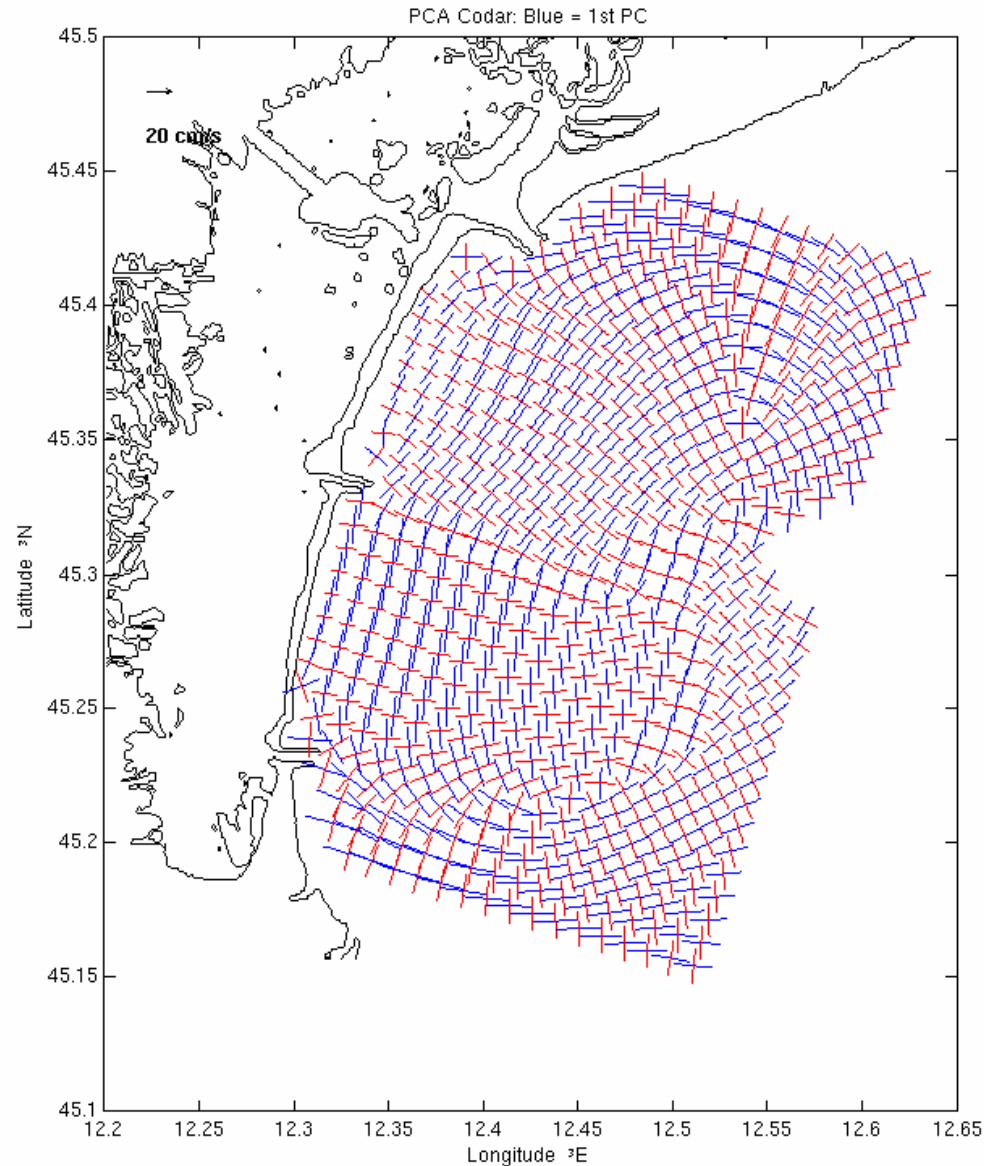
Winds - July 2005:



Annual mean:



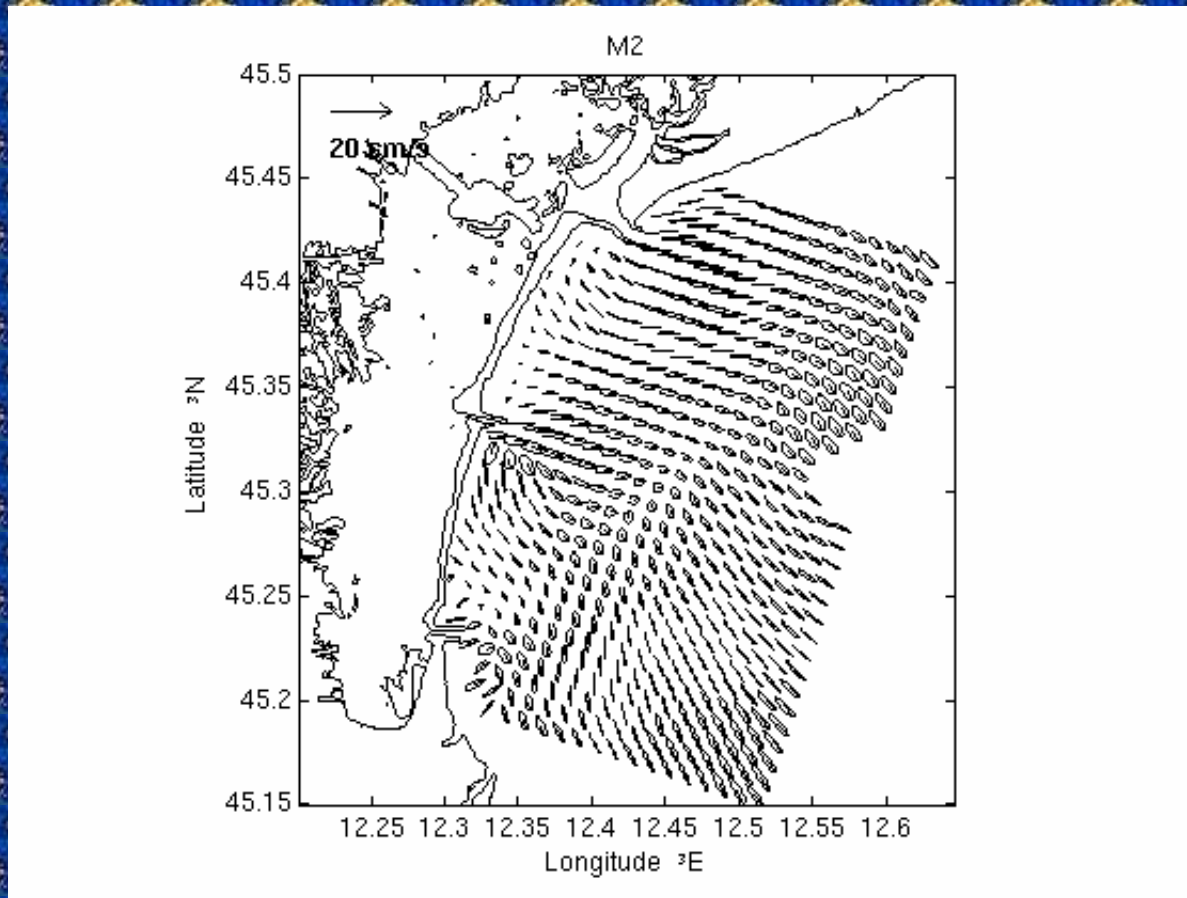
Annual PCA:



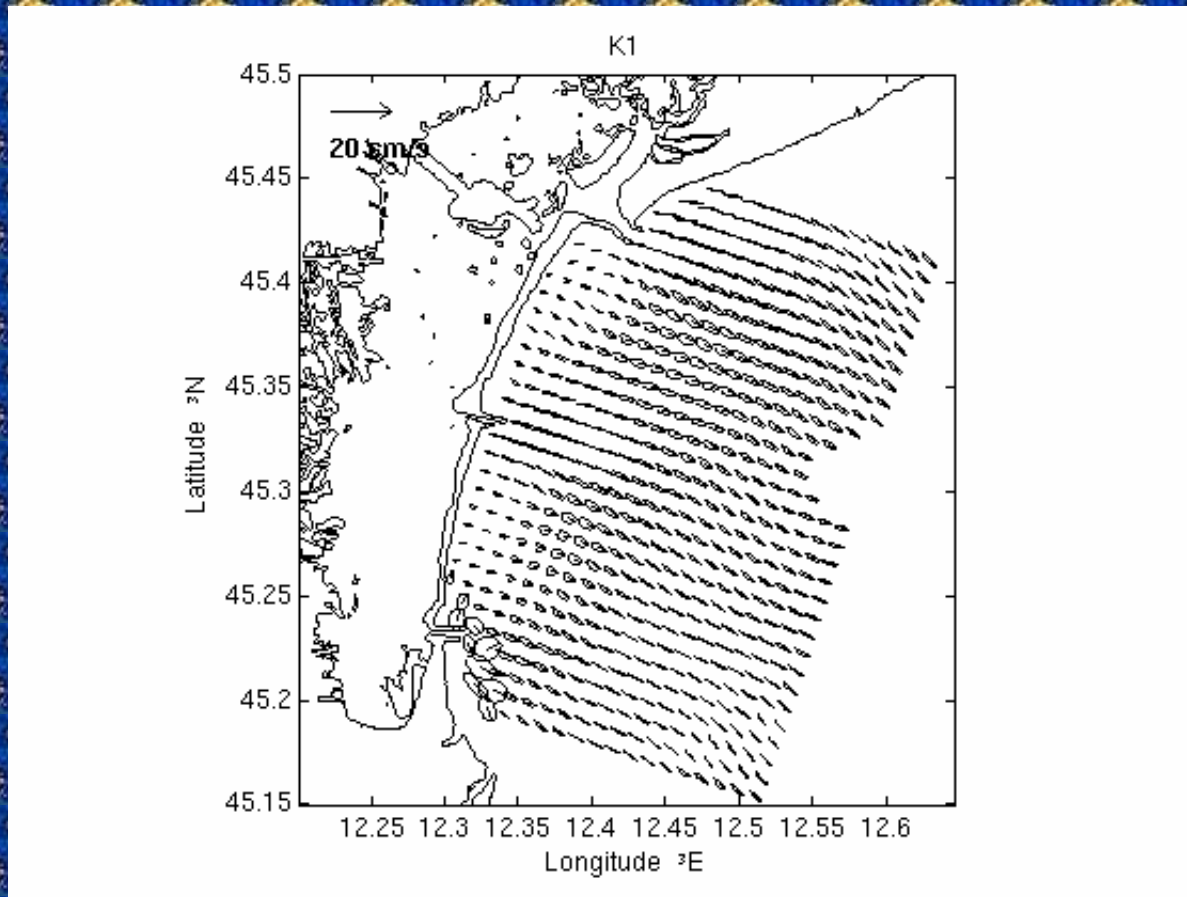
Blue.- Major component

Red.- Minor component

M2 distribution:



K1 distribution:



What about the tidal jet at Malamocco?



Criteria:

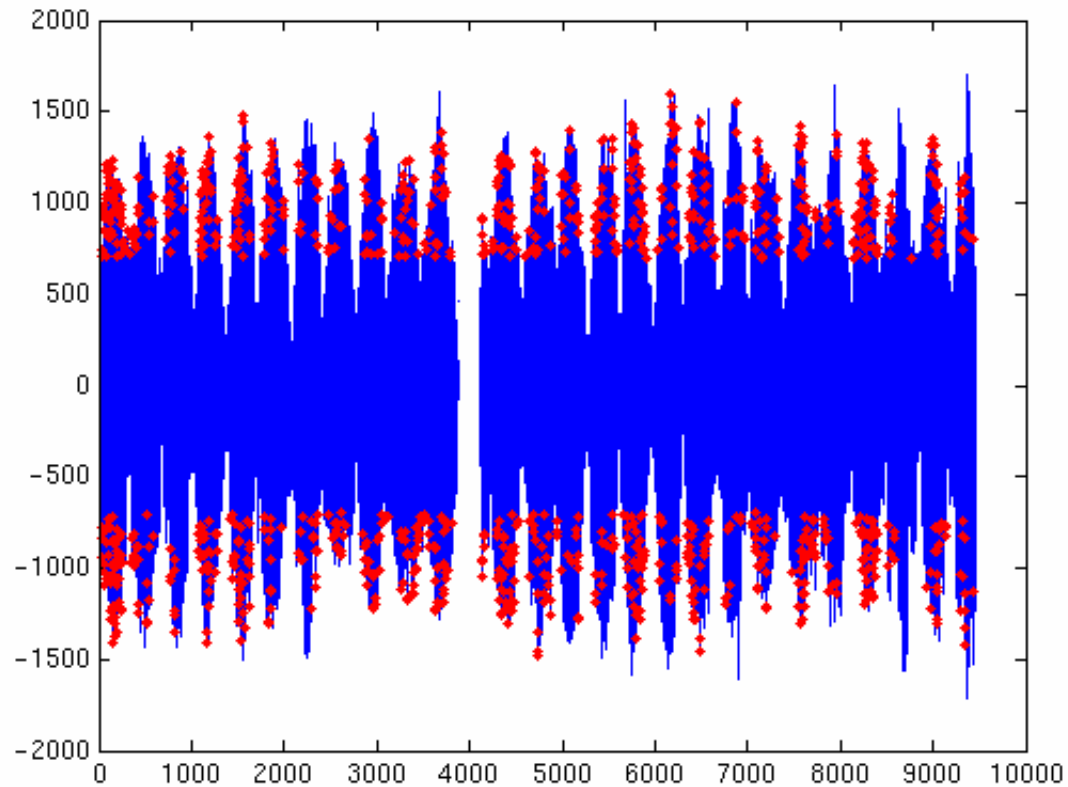
Only low wind-speed conditions AND strong current velocities are taken into consideration.

- Condition 11.- Wind-speed $< 3\text{m/s}$ AND current velocity $> 0.7\text{ m/s}$ (outflow).

- Condition 21.- Wind-speed $< 3\text{m/s}$ AND current velocity $< -0.7\text{ m/s}$ (inflow).

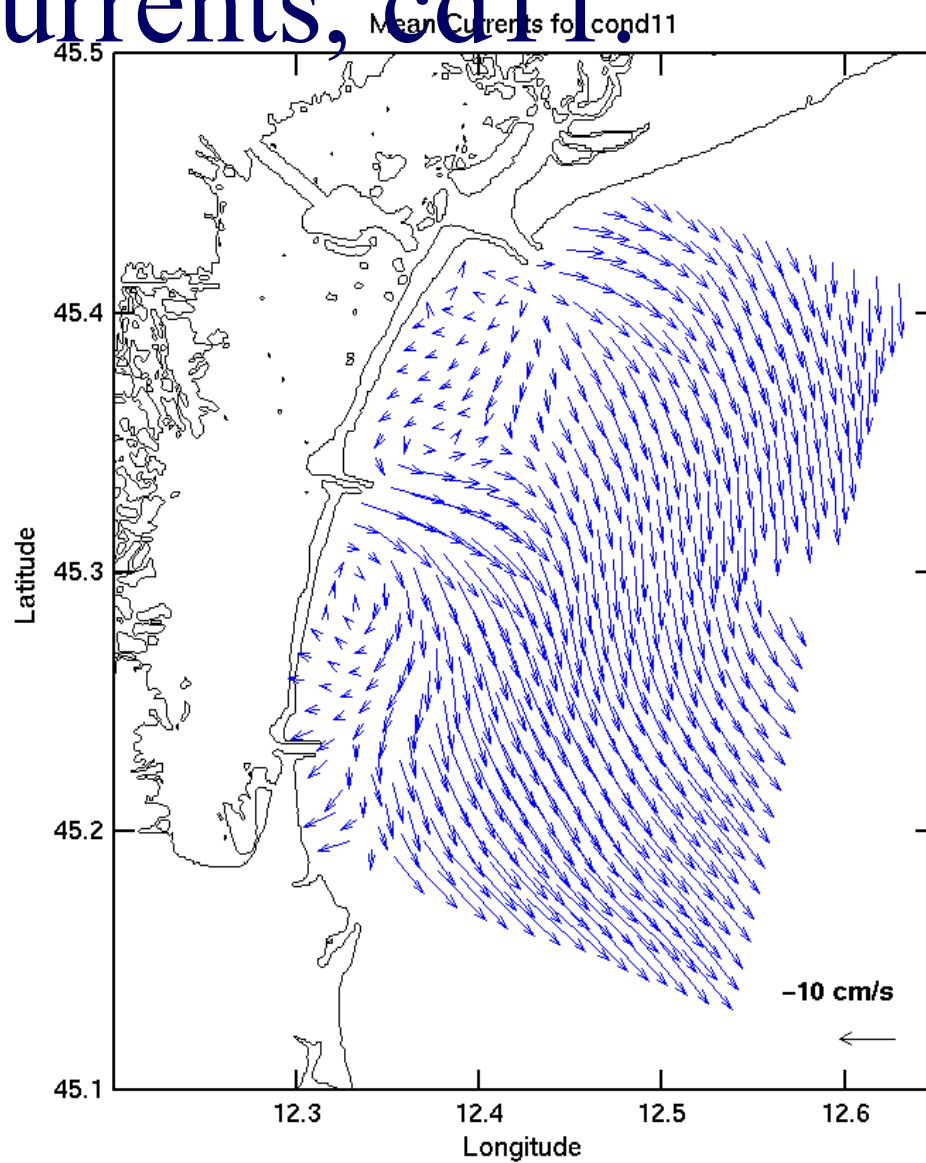
Malamocco record

Condition 11.- N = 590 obs.

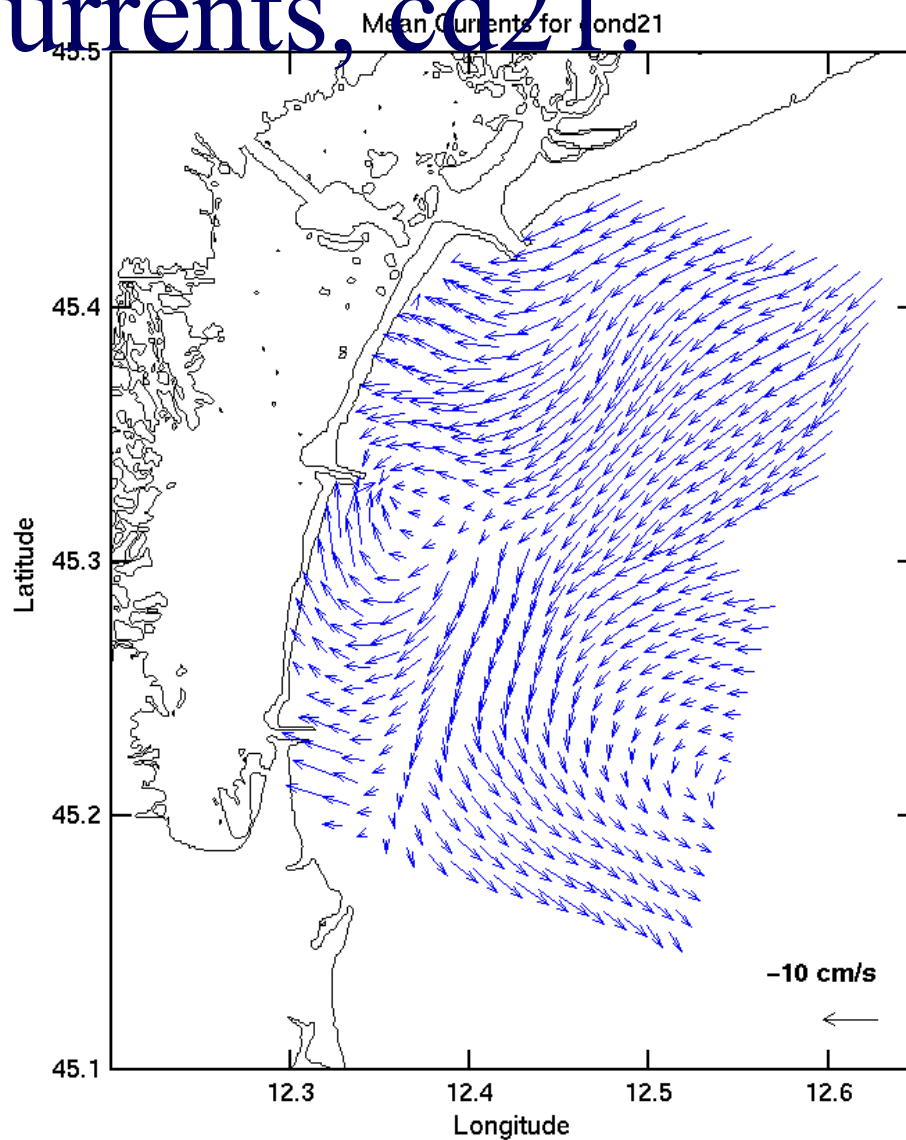


Condition 21.- N = 579 obs.

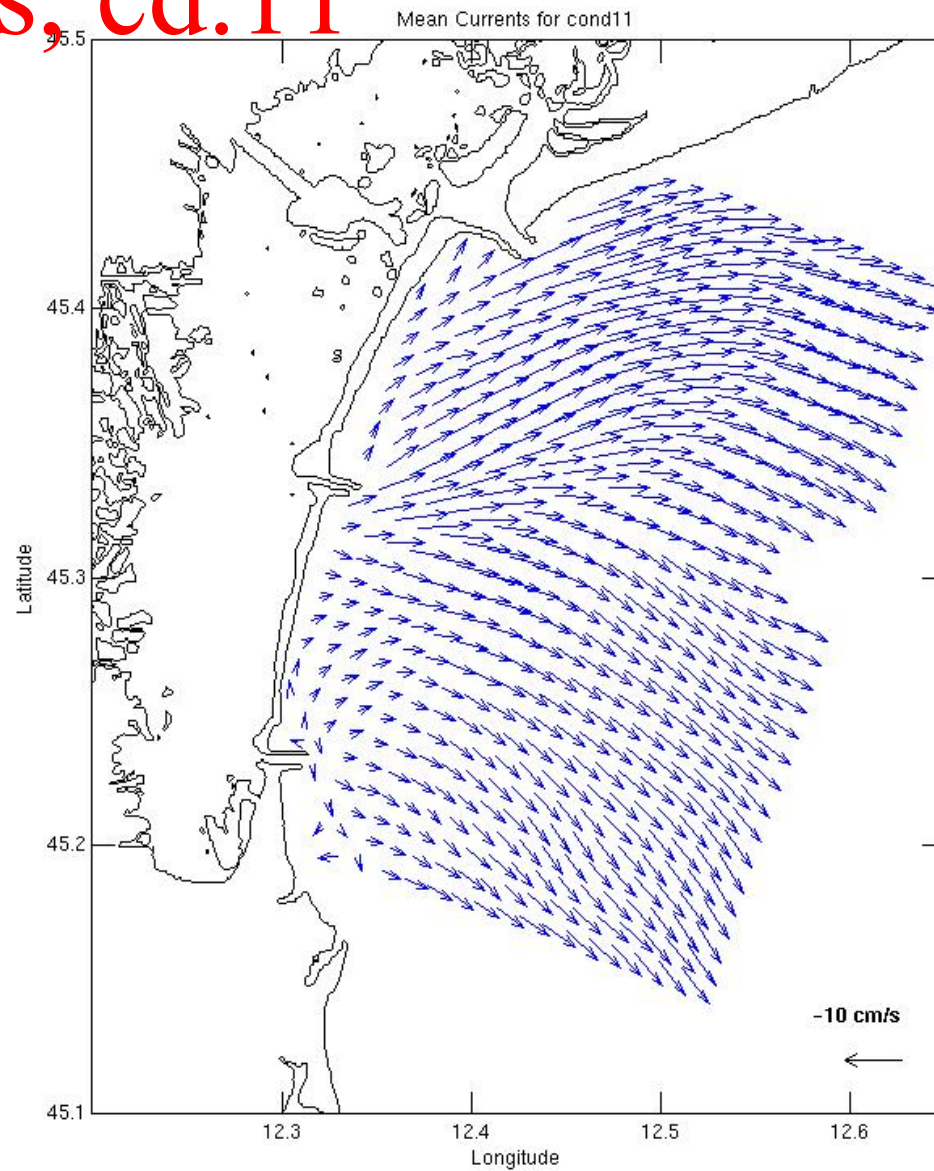
Mean currents, cd11



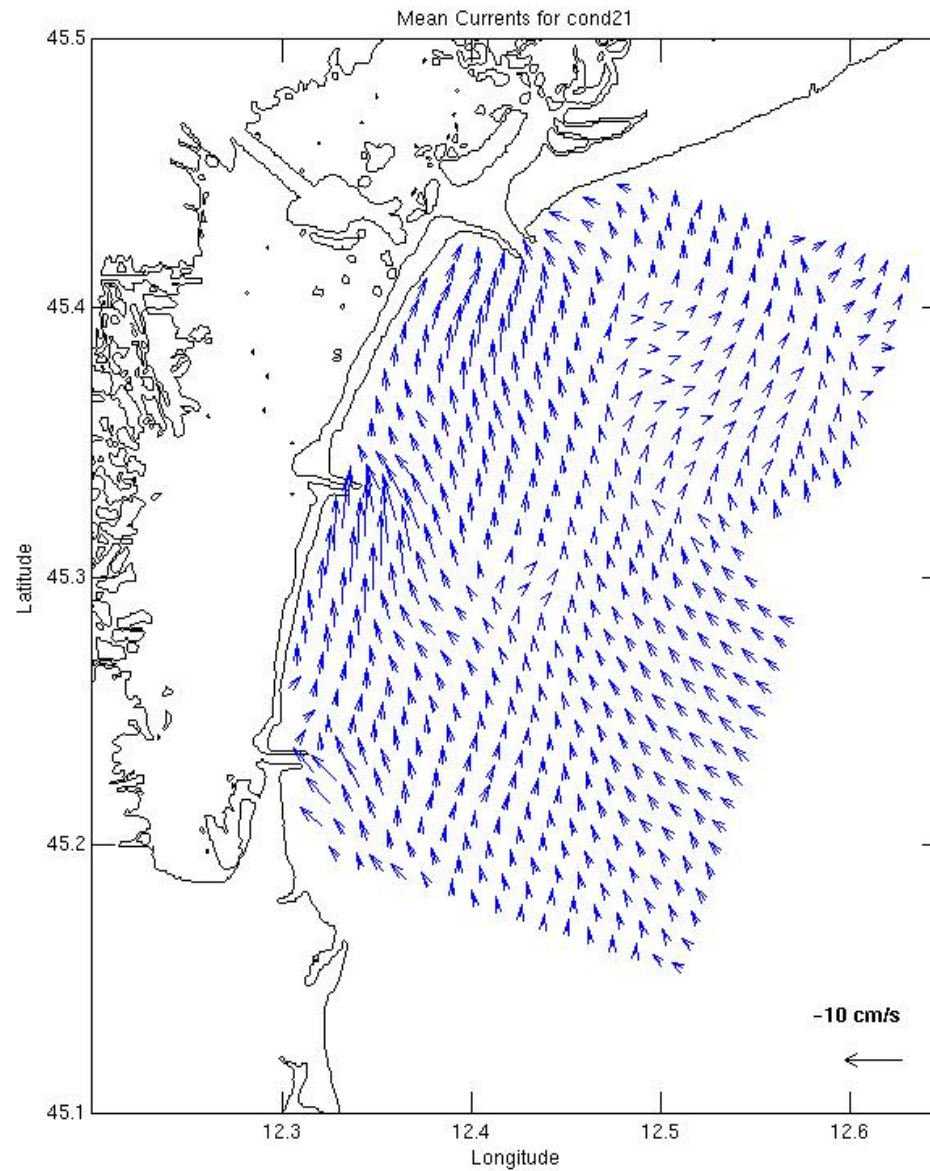
Mean currents, cd21.



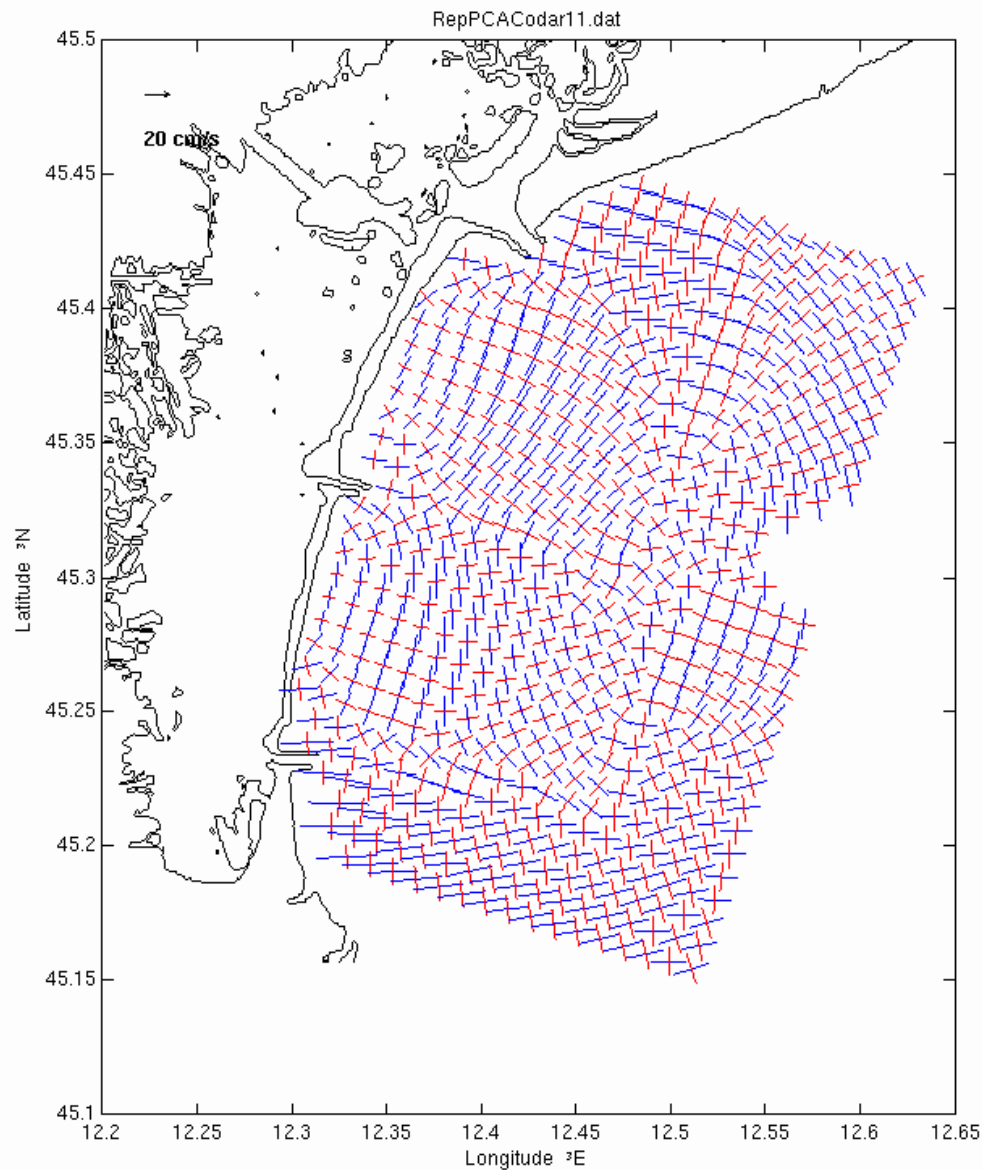
Anomalies, cd.11



Anomalies, cd.21



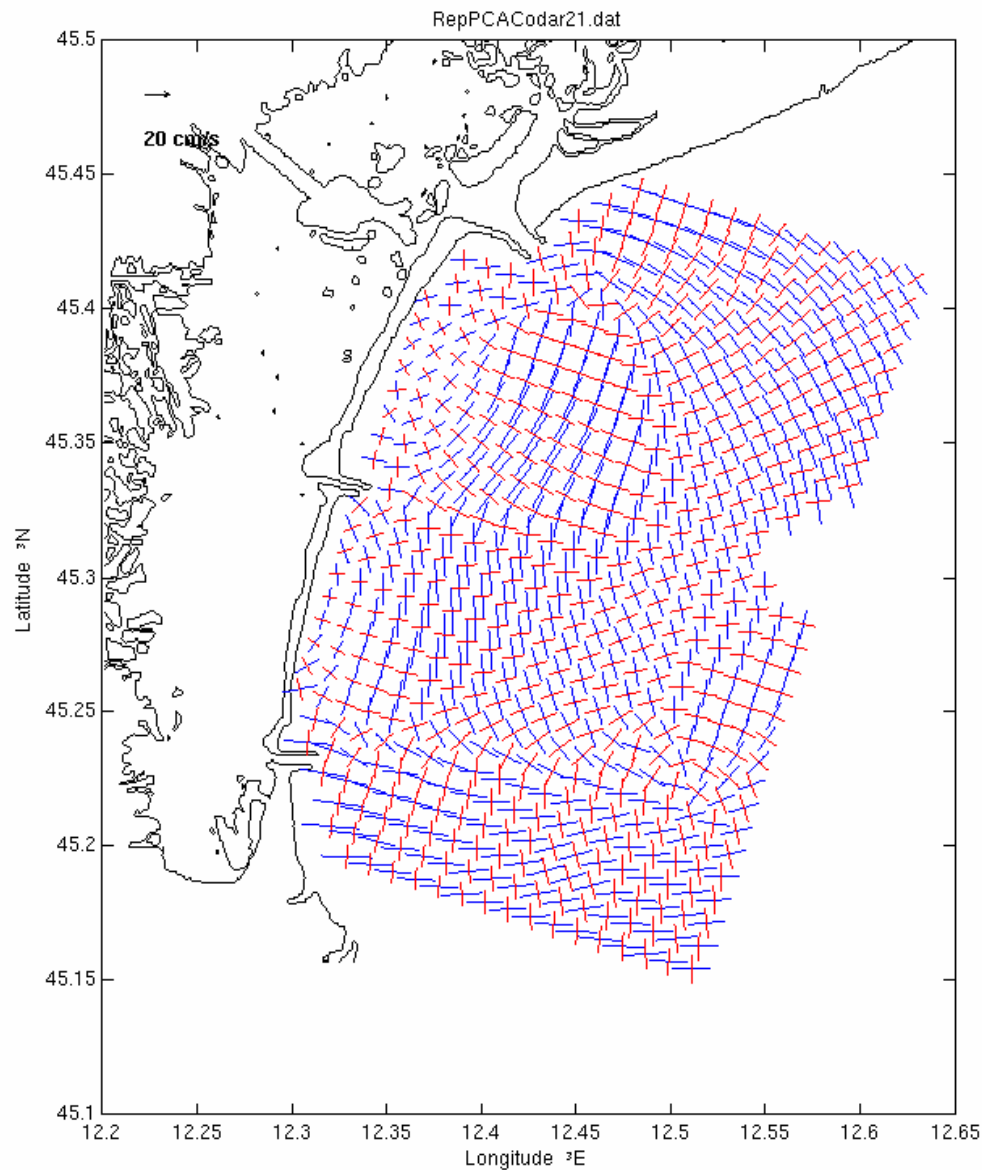
PCA – cd11.



Blue.- Major
component

Red.- Minor
component

PCA – cd21.

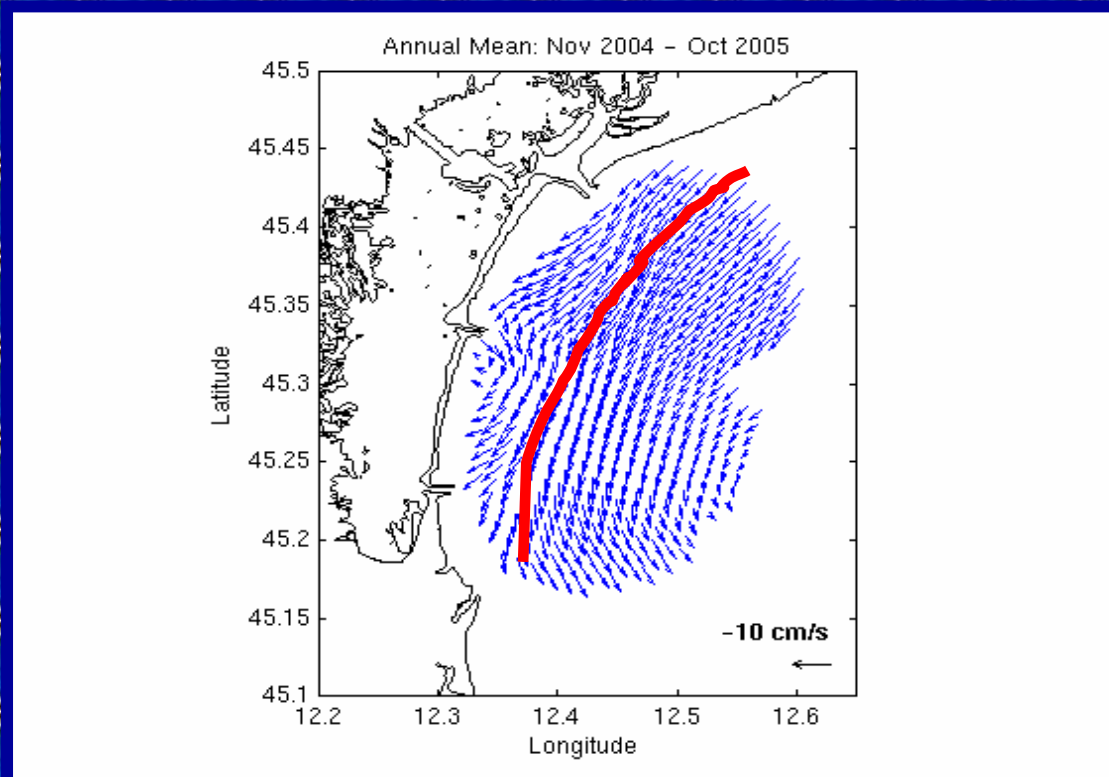


Blue.- Major component

Red.- Minor component

Conclusions

There is coastal strip which is affected by the tidal pumping from the inlets. This is evident in annual time-scale as well as monthly time scale.



Conclusions

Winds have a bimodal distribution in the area, allowing formation of two-strips structure in the current-velocity field.

Inversion in the flow is detected when Scirocco prevails in the bimodal distribution, so currents may flow northward mainly in the coastal strip.

Strong Bora episodes destroy small scale eddies, aligning all current vector field.

Tidal flow from inlets increase vorticity near inlets during the ebb phase. Vortices are well developed during calm weather conditions.

Observed structures are in agreement with those reported by Kovacevic et al., 2004; in this case including tidal forcing.